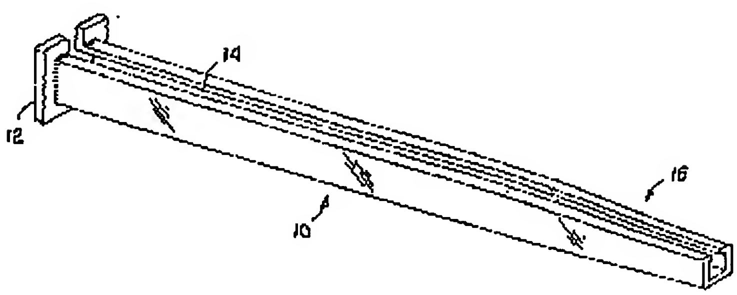
Canadian Patents Database

(12) **Patent Application:** (11) **CA 2128989**

(54) FRICTION ROCK STABILIZERS

(54) DISPOSITIF DE STABILISATION A FRICTION

Representative Drawing:



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ABSTRACT:

ABSTRACT OF THE DISCLOSURE
This invention relates to a friction rock stabilizer which comprises an elongated tube which is made from a resilient metal and has first and second ends, is polygonal in cross-section and is split by a slot which extends over its entire length.

CLAIMS: Show all claims

*** Note: Data on abstracts and claims is shown in the official language in which it was submitted.

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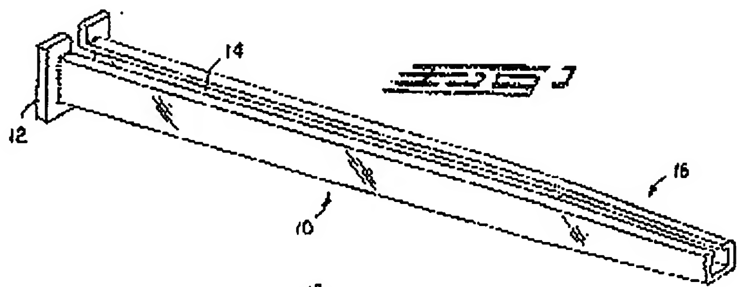

Fig. 1

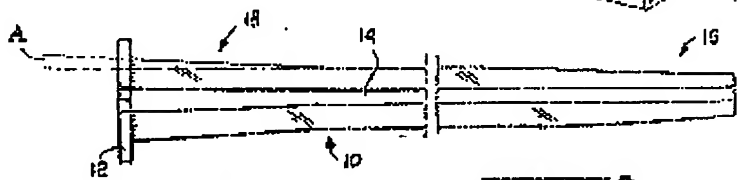

Fig. 2

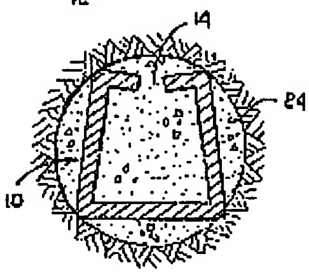

Fig. 3

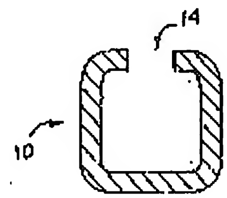

Fig. 5

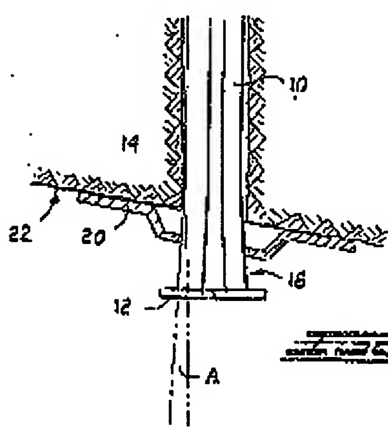

Fig. 4

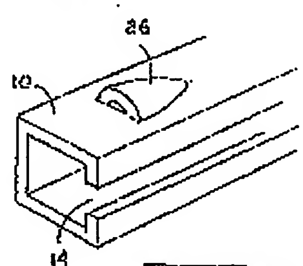

Fig. 6

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FIELD OF THE INVENTION

This invention relates to friction rock stabilizers which are used for controlling stress-induced fracturing and strain bursts in rock in underground mining or tunnelling and in general ground support applications.

BACKGROUND TO THE INVENTION

Friction rock stabilizers have been in widespread use for many years in rock support applications in underground mining and tunnelling.

A friction rock stabilizer generally consists of an elongated metal tube which is circular in cross-section and longitudinally split from one end to the other. In use, the tube is hammered into a hole which has been predrilled into a rock formation. Initially the tube has a greater transverse dimension than the hole with the result that the tube is inwardly deformed to a smaller cross-sectional dimension as it is forced into the hole.

The inward deformation of the tube is accomplished by closure of the longitudinal split and the radial force generated by the natural resilience of the steel from which the tube is made presses the outer surface of the tube into fairly high intimate pressure contact with the inner wall of the hole to anchor the tube frictionally in the hole.

The above split rock stabilizers work well as temporary supports but cannot be used as permanent supports as there is no way, other than the full column radial pressure gripping of the tubes, of positively anchoring the stabilizer tubes in the holes into which they are pressed. The stabilizers, for example, cannot be positively anchored by resin or cementitious grouting as there is no or extremely little space between the outer walls of their tubes and the inner surfaces of the holes in which they are located into which anchor grout may be fed.

SUMMARY OF THE INVENTION

A rock stabilizer according to the invention comprises an elongated tube which is made from a resilient metal and has first and second ends, is polygonal in cross-section and is split by a slot which extends over its entire length.

Preferably, the cross-sectional shape of the tube is substantially square. Conveniently, the corners between the flat surfaces on at least the outer surface of the tube are radiused and could be radiused to approximate that of the hole in which the stabilizer is to be used should a relatively larger friction contact surface be required between the stabilizer tube and the inner wall of a hole.

Further according to the invention the stabilizer includes at the first end of the tube an outwardly projecting stop which is clear of the slot in the tube so that the slot extends over the length of the tube and through the stop if the stop surrounds the mouth of the tube.

Still further according to the invention the tube is tapered to a smaller cross-sectional dimension than the remainder of the tube over a portion of its length towards its second end. The tube could also include a portion of its length which is outwardly flared towards its first end.

In one form of the invention at least one flat face of the tube could carry outwardly projecting formations for anchoring the stabilizer in settable grout which is pumped into the stabilizer hole between the outer wall of the stabilizer and the inner surface of the hole in use. The formations may include openings into the tube.

BRIEF DESCRIPTION OF THE DRAWINGS

The Invention is now described by way of example only with reference to the drawings in which :

FIGURE 1 is a perspective view of one embodiment of a friction rock stabilizer according to the invention,

FIGURE 2 is a shortened plan view of a second embodiment of the stabilizer,

FIGURE 3 is a cross-sectional end elevation of the stabilizer of the invention located in a hole in a rock formation,

FIGURE 4 is a fragmentary side elevation of the rock stabilizer of Figure 2 located in a hole,

FIGURE 5 is a sectioned end elevation of a variation of the rock stabilizer tube, and

FIGURE 6 is a fragmentary perspective view of a short length of yet a further variation of the rock stabilizer of the invention.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

The friction rock stabilizer of the invention is made from a suitable resilient steel such as ASTM A607 Grade 60 Class 1 which has a thickness of between 2.3mm and 3,2mm. The stabilizer typically has a length of between 0,9 and 4 metres and a maximum cross-sectional dimension of between 32mm and 46mm.

The friction rock stabilizer of Figure 1 is shown in the drawing to include an elongated tubular body 10 and a stop 12 which is welded to one end of the body. The stabilizer additionally includes a slot 14 which extends over the entire length of the stabilizer and the stop 12 as shown in the drawing. An end portion 16 of the body tube is tapered to a smaller cross-section at the end of the tube remote from the stop 12 for ease of insertion of the stabilizer body into a hole in which it is to be used.

The embodiment of the friction rock stabilizer of Figure 2 is substantially the same as that of Figure 1 with the exception that the body 10 of the stabilizer includes an outwardly flared portion of its length as shown generally at 18. The length of the flared portion 18 of the tube is outwardly flared from the parallel sided portion of the tube at an angle A of about 3°. The flare may, however, be flared at anything between 2° and 5° in dependence on the application of the stabilizer and the nature of the material which it is to stabilize. The outwardly flared portion 18 of the tube may have a length of between 25mm and 100mm but is preferably about 50mm.

In use the stabilizer is hammered into a predrilled hole in a rock formation which is of smaller diameter than the maximum cross-sectional dimension of the body across the corners of its square cross-sectional shape by means of a suitable dolly which engages the stabilizer over the stop 12 and which is hammered by means of a jack-hammer or the like.

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As the tubular body of the stabilizer is hammered into the hole the cross-sectional dimension of the tubular body is reduced by the narrowing of the slot 20 with the resilience of the metal from which the body is made causing the corners of the body, as shown in Figure 3, to be biased into high pressure contact with four positions on the inner surface of the hole frictionally to lock the stabilizer in the hole. To ensure closure of the slot 20 in the stop 12 the stop plate could be split opposite the centre of the slot to enable the portion of the tube adjacent the slot and the stop 12 to be compressed to avoid jamming of the tube towards its mouth end as it is hammered into a hole.

Prior to the insertion of the tapered end of the body 10 into the hole a large area support washer having a square hole of slightly larger dimension than the square dimension of the stabilizer body 10 is slipped over the body from its tapered end down towards the end which carries the stop 12. In the Figure 2 embodiment of the stabilizer the washer hole is dimensioned to engage the sides of the body 10 just beyond the point at which the portion of the body 16 is flared from the parallel portion of the body.

With the Figure 1 embodiment of the stabilizer the body 10 is hammered fully into the hole until the stop 12 forces the washer hard up against the face of the rock into which the stabilizer has been hammered to support the rock face surrounding the hole.

With the Figure 2 embodiment of the stabilizer the washer, by engaging the flared portion 16 of the tube, will first engage the rock surrounding the mouth of the hole and be hammered towards the stop 12 as the body 10 is further hammered into the hole. The tapered portion of the tube body ensures that there will be firm engagement between the flared portion of the tube and the washer 20 to press the washer hard up against the rock face even if the stop 12 is not hammered fully up against the washer or if the stabilizer hole is not perpendicular to the rock face 22 as illustrated in Figure 4.

In the variation of the friction rock stabilizer of the invention which is illustrated in Figure 5 the corners of the square tube are rounded to increase the metal contact area of the stabilizer tube with the inner surface of the hole for greater frictional contact between the two. Ideally, the radius of curvature of the corners of the tube is made to be the same as the radius of curvature of the hole in which that particular stabilizer is to be used.

As is seen from Figure 3, the outer surfaces of the flat faces of the body 10 tube are spaced from the inner surface of the hole to provide open minor circle segments between the outer surfaces of the stabilizer tube and the hole. These spaces and the space on the inside of the tube may be filled with a resin or cementitious grout 24 to convert the stabilizer from a temporary to a permanent support should this be required.

If it is intended to use the stabilizer of the invention as a grouted permanent support the outer surfaces of the stabilizar body tube could include outwardly projecting formations 26 or any other suitably shaped formations such as ribs or the like which would serve more positively to anchor the stabilizer body 10 in the grout 24 against withdrawal from the hole in which the stabilizer is located. The formation 26 illustrated in Figure 6 could be so punched or pressed from the metal of the tuba that the formation is open through a hole, as illustrated in the drawing, to the inside of the body 10 to ensure the escape of grout from the tube into the surrounding hole portions in which they are located to ensure full column grouting of the stabilizer body in the rock in which the stabilizer is located.

The invention is not limited to the precise details as herein described and the tube body 10 could, for example, have any suitable flat sided triangular or other polygonal cross-sectional shape in place of the square cross-section described above. Additionally, the stop 12 need not necessarily be made from metal plate as described above but could be formed over the mouth of the tube by slitting the tube at the corners of the mouth and folding the flaps so formed back over on themselves on the outside of the tube to provide the necessary stop enlargement.

CLAIMS

1. A rock stabilizer which comprises an elongated tube which is made from a resilient metal and has first and second ends, is polygonal in cross-section and is split by a slot which extends over its entire length.

2. A rock stabilizer as claimed in claim 1 in which the cross-sectional shape of the tube is substantially square.

3. A rock stabilizer as claimed in claims 1 in which the corners between the flat surfaces on at least the outer surface of the tube are radiused.

4. A rock stabilizer as claimed in claim 3 in which the radius of curvature of the corners of the tube approximate that of the hole in which the stabilizer is to be used.

5. A rock stabilizer as claimed in claim 1 including at the first end of the tube an outwardly projecting stop which is clear of the slot in the tube.

6. A rock stabilizer as claimed in claim 1 in which the tube is tapered to a smaller cross-sectional dimension than the remainder of

the tube over a portion of its length towards its second end.

7. A rock stabilizer as claimed in claim 1 in which a portion of the length of the tube is outwardly flared towards its first end.

8. A rock stabilizer as claimed in claim 1 in which at least one flat face of the tube carries outwardly projecting formations.

9. A rock stabilizer as claimed in claim 8 in which the formations include openings into the tube.

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ABSTRACT OF THE DISCLOSURE

This invention relates to a friction rock stabilizer which comprises an elongated tube which is made from a resilient metal and has first and second ends, is polygonal in cross-section and is split by a slot which extends over its entire length.